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10/688,133	10/17/2003	Beibei Wang	MERL-1501	2025

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MITSUBISHI ELECTRIC RESEARCH LABORATORIES, INC.
201 BROADWAY
8TH FLOOR
CAMBRIDGE, MA 02139

EXAMINER	
REKSTAD, ERICK J	
ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Application No.	Applicant(s)	
10/688,133	WANG ET AL.	
Examiner	**Art Unit**	
Erick Rekstad	2621	

Office Action Summary

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 September 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *1-8 and 10-19* is/are rejected.

7)☒ Claim(s) *9* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This is a Final Rejection for Application no. 10/688,133 in response to the amendment filed on September 27, 2007.

Response to Arguments

Applicant's arguments with respect to claims 1-8 and 10-19 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over 'A Uniform Transform Domain video codec based on Dual Tree Complex Wavelet Transform' by Sivaramakrishnan et al. in view of US Patent 6,956,903 to Acharya et al.

[claim 1]

As shown in Figure 1, Sivaramakrishnan teaches a method for encoding a video, comprising:

Applying a dual-tree discrete wavelet transform to the video to generate a plurality of sequences of wavelet coefficients (DT-CWT); and compressing the plurality of sequences to produce a compressed bitstream corresponding to the video (Entropy Encode) (Section 1. Introduction). Sivaramakishnan further teaches DT-CWT as an

improvement over DWT (Page 235 Lines 6-18). Sivaramakrishnan is silent on the use of a three dimensional dual-tree discrete wavelet transform.

Acharya teaches the use of three dimensional subband coding as an extension of 2D subband coding. Acharya further teaches three dimensional subband coding as the benefits of less blocking artifacts, does not employ a separate motion estimation stage, it is scalable both spatially and temporally (Col 1 Lines 24-35). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the DT-CWT of Sivaramakrishnan with a three dimensional version as suggest by Acharya in order to take advantage of three dimensional subband coding.

[claim 4]

Sivaramakrishnan teaches the DT-CWT has six sequences (Second to Last Paragraph in Section 3. Fine-To-Coarse Motion Estimation).

Claims 2, 5, 6 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sivaramakrishnan and Acharya in view of US Patent 6,477,280 to Malvar.

[claims 2, 5 and 6]

As shown above for claim 1, Sivaramakrishnan and Acharya teach an improvement over prior encoding methods by using a Dual Tree Complex Wavelet Transform. Sivaramakrishnan further teaches the use of Entropy Encoding (Fig. 1). Sivaramakrishnan is silent on the selecting iteratively the wavelet coefficients in a large to small order.

As shown in Figure 2, Malvar teaches a wavelet based encoding method which performs a reordering (230) of quantized coefficients and entropy encoding the

reordered coefficients (240) (Abstract, Col 5 Line 64-Col 6 Line 4, Col 6 Lines 1220 and Lines 41-53). Malvar further teaches the use of the reordering and entropy encoding in order to provide easier hardware and software implementations and eliminate blocking artifacts (Col 16 Lines 7-11). In regards to claims 5 and 6, Malvar teaches the entropy encoder may be a content-adaptive arithmetic coder (Col 2 Lines 63-67). It would have been obvious to one of ordinary skill in the art a the time of the invention to use the reordering and entropy encoding steps of Malvar after the quantization step of Sivaramakrishnan in order to provide easier hardware and software implementations and eliminate blocking artifacts.

[claim 15]

As shown above for claim 2, Sivaramakrishnan, Acharya and Malvar teach the requirements of the claim. Sivaramakrishnan is silent on the sequences are encoded bitplane by bitplane in a most significant bit to least significant bit order.

Malvar teaches a feature of the encoder is the encoding on a bitplane basis in order to increase the likelihood of finding large strings of zeros (Col 6 Lines 41-58). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the ordering of Malvar in order to increase the likelihood of finding large strings of zeros as taught by Malvar.

Claims 2, 3, 6, 10, 11, 13, 14, and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sivaramakrishnan and Acharya as applied to claim 1, in view of 'A Matching Pursuit Enhanced Three-Dimensional Wavelet Transform Coder' by Marusic et al.

[claims 2, 3, 6, 10, 11, 16 and 17]

As shown above for claim 1, Sivaramakrishnan and Acharya teach the use of a Dual-tree Discrete Wavelet Transform in a method of encoding a video (Fig. 1). Figure 1 of Sivaramkrishnan, further shows the video encoder includes the steps of motion estimation, quantization, and entropy encoding. Though, Sivaramakrishnan is silent on the specific features of the quantization and entropy encoding.

Marusic teaches a method for encoding wavelets including a Matching Pursuit step (Abstract). In regards to claims 16 and 17, Marusic teaches the frequency subbands can be allocated a bit budget and coded independently from the other subbands in order to provide optimal bit allocation (Page 482, First Column, Last Paragraph). In regards to claim 6, Marusic further teaches the use of context-based adaptive arithmetic coding in order to achieve a high compression ratio at entropy coding (Section III. Context Based BitPlane Coding, Note: Specifically the first paragraph). In regards to claims 3 and 10, Marusic teaches the use of matching pursuit to approximate coefficients of the sequences (Section IV. Matching Pursuit Approximation of High Temporal Frequency Subbands, equation 6). Marusic further teaches the coding in order of importance as required by claims 2 and 11 (Page 484, Second Column, Last Paragraph). Marusic further teaches the matching pursuit is performed before the quantizing and entropy coding (Section V. Experimental Results). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the encoding steps of Marusic with the wavelets of Sivaramakrishnan and

Acharya in order to provide an encoding method which outperforms MPEG-2 as taught by Marusic (Section V. Experimental Results).

[claim 13]

As shown above, Marusic teaches the selecting uses a matching pursuit method (Section IV. Matching Pursuit Approximation of High Temporal Frequency Subbands). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the encoding steps of Marusic with the wavelets of Sivaramakrishnan and Acharya in order to provide an encoding method which outperforms MPEG-2 as taught by Marusic (Section V. Experimental Results).

[claim 14]

Marusic teaches the use of matching pursuit approximation on high temporal frequency subbands as shown above. Marusic further teaches the high temporal frequency subbands contain only a small amount of the whole video-signal energy as required by claim 14 (Page 483, Column 1, Last Paragraph). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the encoding steps of Marusic with the wavelets of Sivaramakrishnan and Acharya in order to provide an encoding method which outperforms MPEG-2 as taught by Marusic (Section V. Experimental Results).

[claim 18]

As shown above for the rejection of claim 16, Marusic teaches each subband can be allocated a bit budget and coded independently form the other subbands (Page 482, First Column, Last Paragraph). Note: each subband contains a subset of the total

number of wavelet coefficients for the video and therefore are subsets of the wavelet coefficients. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the encoding steps of Marusic with the wavelets of Sivaramakrishnan and Acharya in order to provide an encoding method which outperforms MPEG-2 as taught by Marusic (Section V. Experimental Results).

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sivaramakrishnan, Acharya and Marusic as applied to claim 16 above, and further in view of 6,137,915 to Chai.

[claim 19]

As shown above, Sivaramakrishnan, Acharya and Marusic teach the encoding method of claim 16. Sivaramakrishnan, Acharya and Marusic are silent on the ability of the receiver to estimate lost descriptions.

Chai teaches a method for error concealment for Hierarchical Subband encoded video (Abstract, Fig. 5). Chai further teaches wavelet coefficients coded in tree blocks as an example of hierchical subband encoding (Col 2 Lines 17-25). Chai teaches the method for error concealment includes the packetizing wavelet coefficients into "texture packets" so that a lost coefficient can be estimated by using coefficients for the same spatial location from a different subband (Col 4 Lines 43-45, Col 5 Lines 9-23, Col 6 Lines 36-39). It would have been obvious to one of ordinary skill in the art a the time of the invention to use the concealment method of Chai with the video encoding method of Sivaramakrishnan, Acharya and Marusic in order to provide a means for concealing

errors caused by transmitting packets over a noisy communication channel (Col 1 Lines 40-43 and Col 2 Lines 30-33).

Claim 7, 8 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sivaramakrishnan, Acharya and Marusic as applied to claim 2 above, and further in view of US Patent 6,664,913 to Craven et al.

[claims 7, 8, and 12]

Sivaramakrishnan, Acharya and Marusic teach the method of claim 2. Sivaramakrishnan, Acharya and Marusic are silent on the use of a noise shaping method.

As shown in Figure 12, Craven teaches the use of a outer-form noise shaping quantizer in order to provide a lossless coding method for waveform data (Abstract, Col 21 Lines 17-48). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the noise shaping quantizer of Craven with the method of Sivaramakrishnan, Acharya and Marusic in order to provide a means for minimizing quantization noise energy as taught by Craven (Col 21 Lines 43-47).

Allowable Subject Matter

Claim 9 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erick Rekstad whose telephone number is 571-272-7338. The examiner can normally be reached on 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on 571-272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Erick Rekstad
Examiner
AU 2621
(571) 272-7338
erick.rekstad@uspto.gov

GIMS PHILIPPE
PRIMARY EXAMINER